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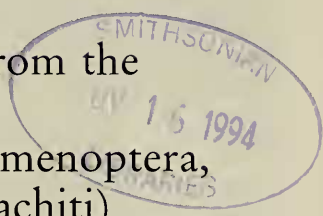
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Fossil Odontomachiti Ants from the Dominican Republic (Amber Collection Stuttgart: Hymenoptera, Formicidae. VII: Odontomachiti)



By Maria L. de Andrade, Basel

With 21 Figures

Summary

Eight new *Odontomachiti* species are described from Dominican amber. Six of them belong to the genus *Anochetus* and two represent the first fossil records for the genus *Odontomachus*. The Recent *Odontomachus* fauna from the Dominican Republic does not differ remarkably from the amber fauna. The amber *Anochetus* fauna differs much more from the Recent Hispaniolan fauna both in its greater number of species and for containing a species with probable Oceanian affinities in addition to species with obvious Neotropical relationships.

Zusammenfassung

Acht neue Arten des Ameisen-Subtribus *Odontomachiti* aus Dominikanischem Bernstein werden beschrieben. Sechs davon gehören zur Gattung *Anochetus*, zwei weitere stellen die ersten fossilen Nachweise der Gattung *Odontomachus* dar. Die rezente *Odontomachus*-Fauna der Dominikanischen Republik unterscheidet sich nicht sehr auffällig von der Bernstein-Fauna. Die *Anochetus*-Fauna des Bernsteins hingegen unterscheidet sich sehr viel stärker von der heutigen Fauna Hispaniolas, sowohl im Hinblick auf ihre größere Artenzahl als auch dadurch daß sie zusätzlich zu den Arten mit offensichtlich neotropischem Bezug eine Art enthält, die verwandtschaftliche Züge mit Formen Ozeaniens aufweist.

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1. Introduction

Previous papers about Arthropods in Dominican amber were published by SCHLEE & GLÖCKNER (1978) and BARONI URBANI & SAUNDERS (1982). These have been rapidly outdated by numerous new contributions which appeared within the last few years. KEILBACH (1982) gives a world catalogue of the amber insects and SPAHR (1981–93) produced a formidable set of corrections and updates to it. POINAR (1992) offers a commented review of plant and animal amber inclusions. These papers contain reference to most published information on amber ants to date. Our knowledge on the Dominican amber ant fauna is taken from the papers of BARONI URBANI (1980 a–d, 1994), BARONI URBANI & DE ANDRADE (1994) BARONI URBANI & WILSON (1987), DE ANDRADE (1992), LATTKE (1990), MACKAY (1991 and 1993), WARD (1992), and WILSON (1985 a–d, 1986).

The sole previously known fossil *Odontomachiti* are two species of *Anochetus* from Dominican amber described by BARONI URBANI (1980b) and MACKAY (1991). In addition SCHLEE (1980, Table 29) presents a very clear illustration of an unidentified ant from Dominican amber that I shall attribute with high probability to an *Anochetus* species to be described later in this paper. WILSON (1985a) mentions the presence of *Odontomachus* in Dominican Amber without explicitly describing the specimen(s) on which the record is based. I have been able to examine a much richer collection of *Anochetus* and of the closest related genus *Odontomachus* for which the present records represent the first fossils the description of which is one of the main purposes of this paper. Both genera dealt with here have been revised by BROWN (1976, 1978). BROWN (1976) considered the Ponerinae, formerly placed in the tribe *Odontomachini* (containing only the two genera *Odontomachus* and *Anochetus* discussed here), as a subtribe of the Ponerini.

In the present paper I describe 8 new fossil species of *Odontomachiti* from Dominican amber, two of which are the first fossil *Odontomachus* to be described and 6 are new species of the genus *Anochetus*. In addition, I shall make some comparisons between Dominican amber *Odontomachiti* and their closest Recent relatives.

2. Material and methods

Ten specimens of *Anochetus* and two of *Odontomachus* have been examined in 11 samples of amber from the Dominican Republic. The following specimens were available for the present study:

Do-2215 (Fig. 1) from the amber collection of the State Museum of Natural History, Stuttgart (Department of Phylogenetic Research). A yellow sample containing, in addition to the ant described here as *O. spinifer*, a microhymenopteron touching the left side of the ant, a piece of vegetable tissue, caterpillar excrement, and soil particles. The state of preservation of the ant can be considered as good, though some structures are missing, i. e. the junctions between femur and the tibia of the

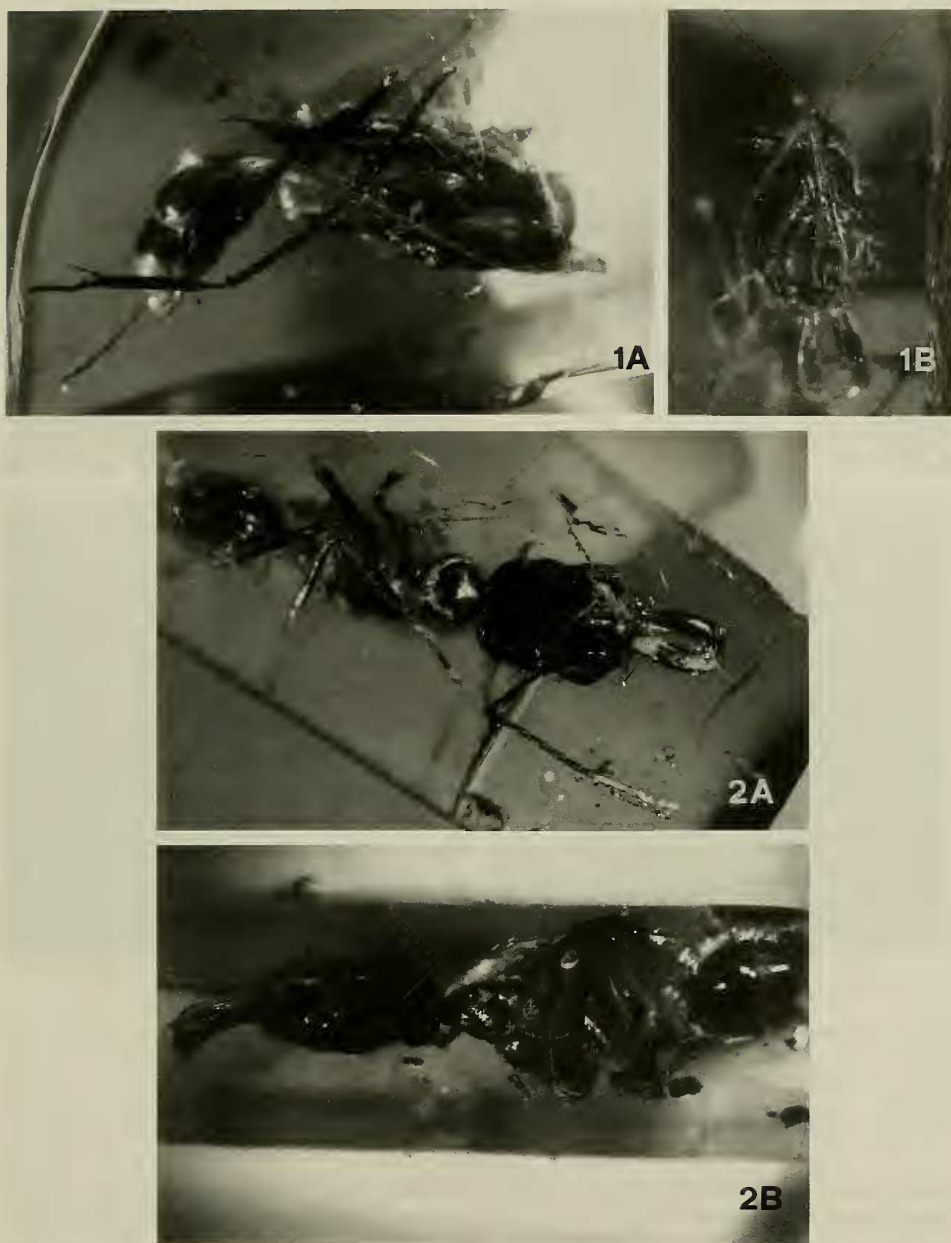


Fig. 1. Specimen Do-2215, habitus, lateral view (A), frontal view of the head (B).

Fig. 2. Specimen A (accession in this paper), habitus, partial dorsal view (A), lateral view (B).

first and third left legs, the tarsus of the middle left leg, the tibiae of the second and third right legs, and the tarsi of all right legs.

A. (accession in this paper) (Fig. 2) purchased in Basel by CESARE BARONI URBANI from Mrs. EDITH BLOCH of the "The Amber Collection" of Puerto Plata. Yellowish

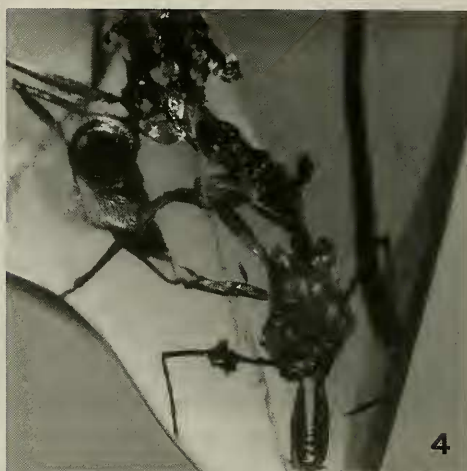


Fig. 3. Specimen Do-5479, habitus, dorsal view.

Fig. 4. Specimen Do-3734, habitus, dorsal view.

Fig. 5. Specimen B (accession in this paper), habitus, lateral view.

Fig. 6. Specimen Do-4192, habitus, lateral view.

amber containing, besides the ant described here as *O. pseudobauri*, pieces of vegetable tissue, a dipteran, a beetle, and pollen grains. The ant specimen is clearly visible but the following structures are missing: the left antenna, the tibiae and tarsi of all left legs, the fourth and the fifth tarsi of the fore right leg, and the second up to the fifth tarsi of the middle right leg. In the gaster the first and second segments are clearly visible; the remaining segments are shrunken.

Do-5479 (Fig. 3) from the amber collection of the State Museum of Natural History, Stuttgart (Department of Phylogenetic Research). A yellow sample containing the ant described here as *A. exstinctus*, a beetle, a thrips larva, a collembolon, a mite, an unidentifiable remnant of a probable insect leg, pollen grains, and soil particles. The ant is complete.

Do-3734 (Fig. 4) from the amber collection of the State Museum of Natural History, Stuttgart (Department of Phylogenetic Research). A yellow amber piece containing, besides the ant described here as *A. extinctus*, three diptera, a small fragment of vegetable tissue, and a few soil particles. The ant appears to have been subject to dorso-ventral compression. The following structures are missing: the last seven right funicular joints, the tibia and tarsus of the fore right leg, the tarsus of the hind right leg, and on the left side the junctions of the femora and tibiae of the middle and hind legs.

B. (accession in this paper) (Fig. 5) purchased in Basel by CESARE BARONI URBANI from Mrs. EDITH BLOCH of the "The Amber Collection" of Puerto Plata. Yellowish-opaque amber containing the ant described here as *A. intermedius*, two collembola, two diptera, two workers and a pupa of Dolichoderinae ants, fragments of vegetable tissue, pollen grains, and soil particles. The *Anochetus* appears to have been subject to variable extents of dorsoventral and lateral compression, leading to different degrees of deformation of many parts of the body which results in a wrinkled appearance.

Do-4192 (Fig. 6) from the amber collection of the State Museum of Natural History, Stuttgart (Department of Phylogenetic Research). A yellow amber containing, besides the ant described here as *A. dubius*, only two soil particles. The preservation of the ant can be considered good, though some structures are missing, i. e. the tibiae and tarsi of both hind legs, and the last four right funicular joints. A brown bacterial growth surrounds the whole body of the specimen.

Do-3346 (Fig. 7) from the amber collection of the State Museum of Natural History, Stuttgart (Department of Phylogenetic Research). A dark yellow sample containing the ant described here as *A. ambiguus*, two specimens of termites of the genus *Nasutitermes* (a nymph and a soldier), an ant of the genus *Proceratium* (a male), two beetles, two acari (a larva and an adult), unidentifiable remains of a probable insect leg, a burnt piece of vegetal tissue, and soil particles. The preservation of the ant can be considered good, though some structures are missing, i. e. the tibiae and tarsi of the middle and hind right legs, and the left antenna. The last gastric segment is shrunken.

Do-4015 (Fig. 8) from the amber collection of the State Museum of Natural History, Stuttgart (Department of Phylogenetic Research). A dark yellow amber piece containing besides the ant described here as *A. ambiguus*, a psocid, an insect excrement, vegetable tissue, and plenty minute air bubbles. The body of the ant (with exception of the gaster) appears to have been subject to latero-longitudinal compressions and is partially wrinkled; the following parts are missing: junctions between femora and tibiae of middle and hind left legs; the last gastric segment is shrunk.

Do-3968 (Fig. 9) from the amber collection of the State Museum of Natural History, Stuttgart (Department of Phylogenetic Research). A yellow opaque sample containing, besides the ant named here as *A. brevidentatus*, unidentifiable fragments of a probable insect cuticle, a small fragment of vegetable tissue, plenty air bubbles, fragments of a dipteran, and soil particles. The trunk of the ant is transparent, other parts of the body are also transparent but slightly darker; the following parts are missing: the right tibia and tarsus of the middle leg; femur, tibia and tarsus of the hind leg.

Do-2846 (Fig. 10, 11) from the amber collection of the State Museum of Natural History, Stuttgart (Department of Phylogenetic Research). A yellow amber piece



Fig. 7. Specimen Do-3346, habitus, lateral view.

Fig. 8. Specimen Do-4015, habitus, lateral view.

Fig. 9. Specimen Do-3968, habitus, dorso-lateral view.

containing the ants described here as *A. lucidus*, fragments of parts of tarsi probably belonging to a third specimen of *A. lucidus*, a dipteran, and soil particles. The amber was cut to separate the specimens. The preservation of both specimens is good.

Do-3955 (Fig. 12) from the amber collection of the State Museum of Natural History, Stuttgart (Department of Phylogenetic Research). A yellow amber piece containing, besides the ant described here as *A. conisquamis*, two specimens of Kallotermitidae (two winged adults), pieces of termite wings, two diptera, and an unidentifiable fragment of a probable insect leg. The preservation of the ant can be considered good, though some structures are missing: i. e. on the right side the funiculus, the junction of femur and tibia of the middle leg, and the femur, tibia and tarsus of the hind leg; and on the left side the last funicular joint and the tarsus of the fore leg.



Fig. 10. Specimen Do-2846-1, habitus, lateral view (A), head in frontal view (B).

Fig. 11. Specimen Do-2846-2, habitus, head in frontal view.

Fig. 12. Specimen Do-3955, habitus, lateral view.

Measurements and indices used in the descriptions are as defined by BROWN (1976, 1978) for these genera.

Most of the amber pieces were cut and re-polished to allow better observation of the specimens, and most of the measurements, drawings, and photographs were made in 66% sucrose solution. The dentition of some species studied here is more visible in ventral view. Incompletely resolved or incompletely drawn parts correspond to poorly visible body parts of some amber specimens.

3. Descriptions of the fossil species

Odontomachus spinifer n. sp.

Fig. 13

Holotype: Worker (unique) in the amber sample Do-2215 from the collection of the State Museum of Natural History, Stuttgart (Department of Phylogenetic Research).

Derivatio nominis: From the Latin *spinifer* (= bearing a spine).

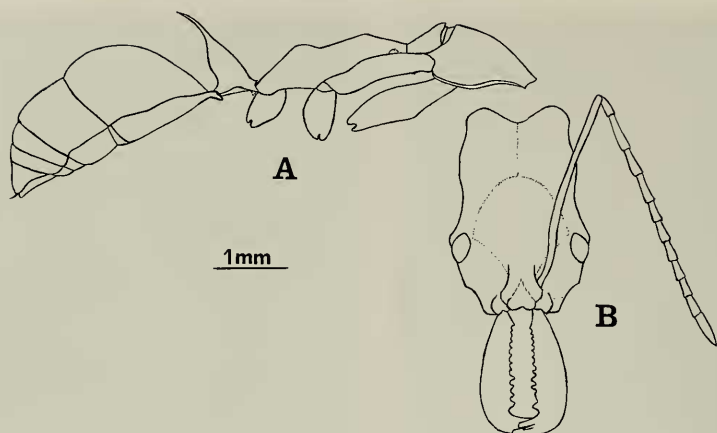


Fig. 13. *Odontomachus spinifer* n. sp. Worker, holotype. Lateral view (A), full frontal view of the head (B). Appendages omitted.

Diagnosis.— An *Odontomachus* of the subgroup which includes *affinis*, *mayi* and *panamensis* of the *haematodus* species group as defined by BROWN (1976), but differing from all these species for the petiolar spine longer than the maximum width of the petiole and directed backwards.

Worker (Fig. 13): Measurements (in mm) and indices: TL 11.08; HL 2.60; HW 1.64; ML 1.52; SL 2.68; eye maximum width 0.44; WL 3.5; petiole maximum length 0.6; CI 63.07; MI 58.46; SI 163.41.

Description.— Head massive, $\frac{2}{3}$ longer than its width. Posterior width of the head one time broader than the maximum pronotal width. Eyes large, $\frac{1}{4}$ of the head width. Scapes, bent backwards, passing the posterior margin of the head, and slightly shorter than the head length. Second funicular joint one time longer than the first and longer than the remaining ones. Mandibles stout, slightly shorter than the head width; the masticatory borders have 12 preapical teeth decreasing in size basally; the apex consists of three teeth with the apical and subapical teeth stout, with rounded tips, and slightly shorter than the maximum width of the mandibular blades; the intercalary tooth is the shortest and with a slightly angular tip.

Trunk slender and long. Mesonotum anteriorly convex and declivous posteriorly. Mesopleurum dorsally margined, its anterioventral margin with low triangular lobe. Propodeum almost straight in side view, except two low convexities on the anterior and posterior parts of the dorsum; its declivous face is straight.

Petiole slender, with slightly convex anterior and posterior faces. Petiolar spine slender, longer than the width of the petiole and directed backwards. Ventral process of the petiole rounded and placed anteriorly.

First gastric segment bell shaped in dorsal view; its anterior face sloping and becoming convex dorsally, its sides slightly convex and its ventral face almost straight. Sting partially retracted.

Sculpture: frons and posterior portion of the antennal fossae longitudinally striate with anteriorly converging striae. Posterior part of the dorsum of the head, anterior portion of the antennal fossae, scapes, mandibles, center of the mesopleura, legs,

petiolar node and gaster shining and covered with minute punctuation giving a slightly opaque aspect. Funiculi coarsely punctate. Disc of pronotum with circular striae, its sides and postero-median part transversally striate. Mesonotum, borders of the mesopleura, and propodeum transversally striate. Petiolar node with the posterior part of its ventral side horizontally striate.

Pilosity: body with short, decumbent to appressed, fine, pointed hairs, sparser on the thorax. Erect to suberect pointed hairs, 0.20–0.24 mm long, placed as follows: three pairs on the posterior portion of the frons and a pair on the posterior portion of the antennal fossae. Each side of pronotum with 2 erect, pointed hairs 0.32 mm long. Legs and petiole with erect to suberect, sparse, pointed hairs 0.12–0.16 mm long. Coxae and gaster with erect to suberect, pointed hairs 0.20–0.40 mm long, abundant on the gaster, sparse on the coxae and rare on the femora. Ventral face of the mandibles with hairs disposed as follows: 3 hairs close to the base 1.0–1.2 mm long, and three pairs before the apical teeth 0.36–0.48 mm long. Sides of the apical teeth with 5 pairs of suberect to subdecumbent, pointed hairs 0.20–0.28 mm long.

Colour: head, coxae, trocanter, femora, and petiole yellow-reddish and slightly shining. Mandibles, antennae, tibiae, tarsi and gaster reddish to brownish and equally slightly shining.

Relationships. — *O. spinifer* belongs to the *haematodus* species group, and is closely related to *affinis*, *mayi* and *panamensis* with which it shares the smooth vertex. The presence of a petiolar spine longer than the maximum petiolar width is likely to be an apomorphic character present only in *spinifer* vs. a petiolar spine shorter than the maximum petiolar width which I interpret as a plesiomorphous character shared by the three Recent species. If this interpretation is correct, this suggests that a long petiolar spine is a secondary adaptation and appeared several times in the course of *Odontomachus* evolution, while the shorter petiolar spine represents the primitive condition.

The distribution of the three reported Recent species close to *spinifer* is as follows: *O. affinis* SE Brazil, *O. mayi* Amazon Basin and Guyana, and *O. panamensis* Panama and Costa Rica. Until now only two species of *Odontomachus* have been reported from Hispaniola, i. e. *bauri* and *insularis* (BROWN, 1976). Both species also belong to the *haematodus* species group but they differ from the fossil in that the striation of the cephalic dorsum reaches almost to the nuchal carina.

Odontomachus pseudobauri n. sp.

Fig. 14

Holotype: Worker (unique) in the amber sample A deposited in the Natural History Museum, London, U. K.

Derivatio nominis: From the Greek *pseudo* (= false) and *bauri* (a specific name in the genus *Odontomachus*).

Diagnosis. — An *Odontomachus* of the *haematodus* species group, very close to *bauri*, but differing from the worker of the latter for the striae on the pronotal disc disposed in circles, and those on the posterior $\frac{1}{4}$ of the pronotal dorsum transverse instead of longitudinal on the whole pronotal dorsum.

Worker (Fig. 14): Measurements (in mm) and indices: TL 9.28; HL 2.48; HW 1.76; ML 1.32; SL 2.33; eye maximum width 0.44; WL 3.0; petiole maximum length 0.68; CI 70.96; MI 53.2; SI 131.82.

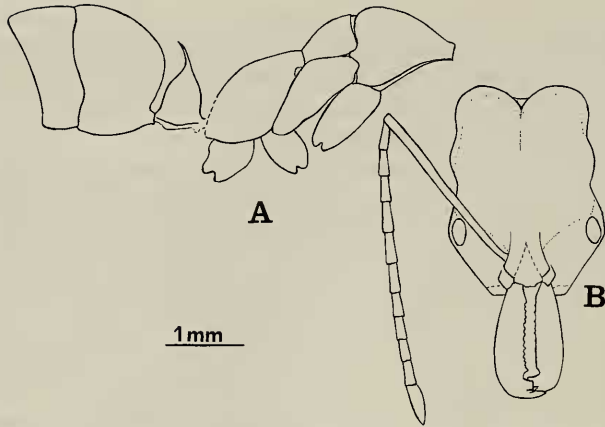


Fig. 14. *Odontomachus pseudobaui* n. sp. Worker, holotype. Lateral view (A), full frontal view of the head (B). Appendages omitted.

Description. — Head about $\frac{1}{3}$ longer than broad. Eyes slightly longer than the maximum width of the mandibles with teeth. Scapes passing the posterior margin of the head by 2 times their maximum width. Second funicular joint $\frac{1}{4}$ longer than the first. Mandibles broad, $\frac{1}{4}$ shorter than head width; the masticatory borders have 14 teeth on the right and 13 teeth on the left, decreasing in size basally; mandibular apex is composed of three teeth of which the subapical one is stout and truncate; the intercalary tooth is $\frac{1}{2}$ the length of the apical tooth and both have an acute tip.

Trunk short, $\frac{1}{4}$ longer than the head length. Pronotum convex in side view, its maximum width slightly less than $\frac{2}{3}$ of the head width. Mesonotum anteriorly convex and declivous posteriorly. Mesopleurum dorsally margined, its anterioventral margin with a rounded lobe. Propodeum in side view anteriorly convex and declivous posteriorly.

Petiolar node dome-shaped, the anterior and posterior faces convex. Petiolar spine slender, $\frac{1}{3}$ shorter than the maximum width of the petiole and directed backwards. Ventral process of the petiole rounded and anterior.

First gastric segment broad; its anterior face almost straight, convex dorsally, and its sides and sternum convex.

Sculpture: frons, posterior portion of the antennal fossae up to near the nuchal carina longitudinally striate. The striae on the posterior part of the cephalic capsule finer than those on the anterior part. Occipital angles, sides of the head, anterior portion of the antennal fossae, scapes, legs and gaster shining and with minute punctuation slightly denser on the funiculi and legs than on other body parts. Pronotal disc covered by circular striae coarser than those on the cephalic dorsum; posterior sides of the pronotum and posterior $\frac{1}{4}$ of its dorsum transversally striate. Mesonotum, mesopleural borders, and propodeum similarly transversally striate; the striae on the propodeum are the coarsest of the whole body. Center of the mesopleurum punctate and opaque. Petiolar node longitudinally striate, petiolar spine shining, only minutely punctate.

Pilosity: body with sparse, short, decumbent to appressed, fine, pointed hairs. Erect to suberect pointed hairs distributed as follows: one on the right side of the

posterior part of the antennal fossae 0.16 mm long; and three on each side of the pronotum 0.20–0.28 mm long. Femora, petiole and petiolar sternum with suberect sparse, pointed hairs 0.08–0.12 mm long, equally present but rare on the thorax and gaster. Coxae and femora with rare, gaster with abundant erect pointed hairs 0.16–0.24 mm long. Mandibles ventrally with five pairs of hairs as follows: two pairs close to the base 0.68–0.72 mm long, and three pairs before the apical teeth 0.36–0.40 mm long. Sides of the intercalary and subapical teeth with 3–4 pairs of subdecumbent pointed hairs 0.16–0.20 mm long.

Colour: head and mandibles shining reddish. Antennae, thorax, petiole, and legs orange to reddish and less shining. Gaster shining brownish.

Relationships. — *O. pseudobauri* belongs to the *haematodus* group (as defined by BROWN, 1976) which includes the large majority of *Odontomachus* species of the New World. The fossil species has many similarities with the Recent species *bauri* known from Central and tropical South America, Galapagos, and most of the West Indies (major exceptions Cuba and Bahamas). The main differences between the two species are: the pronotal dorsum in *pseudobauri* has about 25 circular striae vs. a pronotal dorsum with longitudinal striae only in *bauri*; the center of the mesopleura is opaque and punctate in *pseudobauri* and shining in *bauri*; the gastric segments (first and second only visible) shining in *pseudobauri* and gastric segments finely punctate in a sample of *bauri* present in the Santschi's collection.

According to BROWN (1976) *O. bauri* has been confused with "*O. haematodes*" in most previous literature because of the presence of frequent sculptural variants between the two species. But, after considering the metasternal process appearing as a paired, slender and acute spine in *haematodus* or bicuspidal with a notch in the middle in *bauri*, the intermediate forms could be assigned unequivocally to one or the other. In *pseudobauri* the metasternal process is bicuspid with a notch in the middle like the true *bauri*. BROWN (l. c.) suggested that the closest relative of *bauri* is *haematodus*. With the discovery of *pseudobauri* in Dominican amber it is this latter which appears to be the most closely related to *bauri*.

Since *bauri* belongs to the contemporary Hispaniolan fauna, *pseudobauri* is likely to represent a clade ancestral to *bauri*, now extinct.

Anochetus exstinctus n. sp.

Fig. 15

Holotype: Worker in the amber sample Do-5479 of the collection of the State Museum of Natural History, Stuttgart (Department of Phylogenetic Research).

Paratype: Worker in the amber sample Do-3734, belonging to the same collection as the holotype.

Derivatio nominis: From the Latin *exstinctus* (= extinct).

Diagnosis. — An *Anochetus* of the *emarginatus* group, close to *oriens* and *kempfi*, but differing from the first for its acute petiolar spines and higher propodeal spines, and from the second for having mandibles with 12–13 teeth instead of 7–9, for its pronounced constriction between the first and second gastric segments, and for its smaller size.

Worker (Fig. 15 holotype): Measurements (in mm) and indices: TL holotype 7.0, paratype 7.48; HL holotype 1.48, paratype 1.44; HW holotype 1.16, paratype 1.08; ML holotype 1.08, paratype 1.16; SL holotype 1.56, paratype 1.76; eye maximum length holotype and paratype 0.28; WL holotype 2.04, paratype 2.32; petiole maximum length holotype 0.48, paratype 0.56;

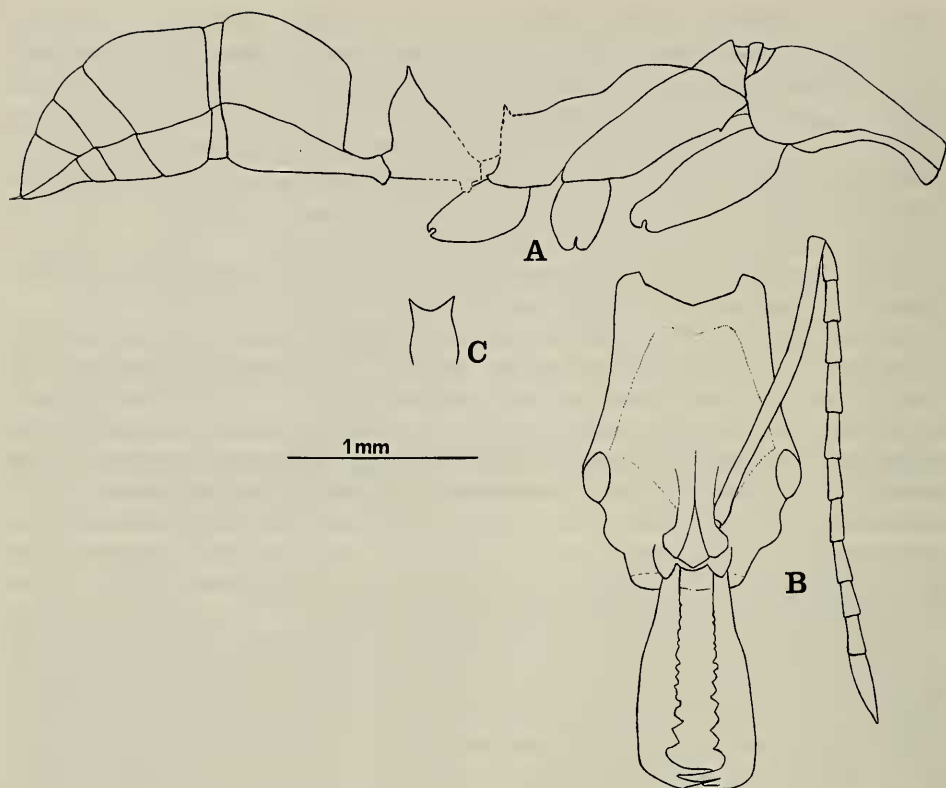


Fig. 15. *Anochetus extinctus* n. sp. Worker, holotype. Lateral view (A), full frontal view of the head (B) and petiole (C). Appendages omitted.

CI holotype 78.4, paratype 75; MI holotype 72.3, paratype 80.5; SI holotype 134.5, paratype 133.3.

Description. — Head narrow posteriorly, more than $\frac{1}{4}$ longer than broad. Eyes longer than the maximum width of the mandibles including the teeth. Scapes passing the posterior margin of the head by twice their maximum width, and longer than head length. Mandibles slightly shorter than head width, slightly less than $\frac{2}{3}$ head length; mandibular blades gradually enlarging from the base toward the apex; the masticatory borders have 12 teeth and denticles, decreasing in size basally; mandibular apex bearing three slender teeth, with the apical and subapical equal in size, and the intercalary less than $\frac{1}{2}$ their size.

Trunk slender, more than $\frac{1}{3}$ longer than the head length. Pronotum and mesonotum convex. Anteroventral margin of the mesopleura with an acute triangular lobe. Propodeal dorsum with two convexities, one high on the anterior part and the other low on the median part; posterior part declivous. Propodeal spines 0.08 mm long.

Petiolar node with the anterior face less convex than the posterior. Petiolar spines slender and 0.12 mm long. Ventral process of the petiole anterior.

Anterior face of the first gastric segment straight, with dorsum, sides and sternum slightly convex. Constriction between first and second segment pronounced.

Sculpture: frons and posterior portion of the antennal fossae longitudinally striate. Posterior $\frac{1}{4}$ of the cephalic dorsum, anterior portion of the antennal fossae, mandibles, center of the mesopleura, petiole and gaster shining and with sparse punctuations denser on the dorsum of the gastric segments. Pronotum irregularly striate, on its disc the striae placed in semi-circular pattern, and on the sides almost longitudinal. Dorsum of mesonotum transversally striate, and on its sides longitudinally. Anterior part of the propodeal dorsum longitudinally striate on its first half and on the posterior half reticulate and coarsely punctate; median and posterior parts of the propodeal dorsum with coarse transverse striae. Mesopleural borders and propodeal pleurae transversally striate. Base of the petiolar node with weak longitudinal striae. Coxae, trochanters, proximal half of the femora and petiole slightly shining and with minute punctures; distal half of the femora, tibiae, tarsi and antennae opaque and strongly punctate.

Pilosity: body with sparse, short, appressed, fine, pointed hairs. Erect, thick pointed hairs as follows: a pair on the posterior portion of the antennal fossae 0.12 mm long; a pair on the anterior portion of the pronotal disc 0.20 mm long; sparse on the gaster and 0.12–0.20 mm long; on the coxae up to the femora the hairs are rare, suberect and 0.12–0.16 mm long. Ventral face of the mandibles with hairs disposed as follows: one pair close to the base, and three pairs before the apical teeth. Sides of the apical teeth with 4 pairs of subdecumbent pointed hairs 0.08–0.12 mm long.

Colour: body brown, coxae, trochanters, proximal half of the femora reddish.

Paratype. — It differs from the holotype for its slightly larger size, for the mandibles with 13 teeth instead 12, and longer propodeal and petiolar spines.

Additional material: An excellent colour picture of a probable third specimen of *Anochetus extinctus* (not available for study for this paper) has been published by SCHLEE (1980).

Relationships. — *A. extinctus* is a member of the *emarginatus* species group and it appears to be particularly related to *oriens* and *kempfi*, two species which according to BROWN (1978) belong to different superspecies within the *emarginatus* group. The main differences between *extinctus*, *oriens*, and *kempfi* are: the petiolar and the propodeal spines in *extinctus* are much longer than those of *oriens*; *extinctus* differs from *kempfi* for its serially dentate mandibles, for the pronounced constriction between the first and second gastric segments, and for its smaller size. *A. extinctus* shares with *A. kempfi* and *A. oriens* the following probable synapomorphic characters: with *oriens* the serially dentate mandibles and pronounced gastric constriction; with *kempfi* the long petiolar and propodeal spines.

The pronotum covered by irregular striae is probably the main apomorphic character in the new fossil species described here.

Anochetus intermedius n. sp.

Fig. 16

Holotype: Worker (unique) in the amber sample B now deposited in the Natural History Museum, London, U. K.

Derivatio nominis: From the Latin *intermedius* (= intermediate).

Diagnosis. — An *Anochetus* species easily separable from those previously described for the following character combination: medium-size, long petiolar spines, short but developed propodeal spines, and mandibles with 7–8 teeth.

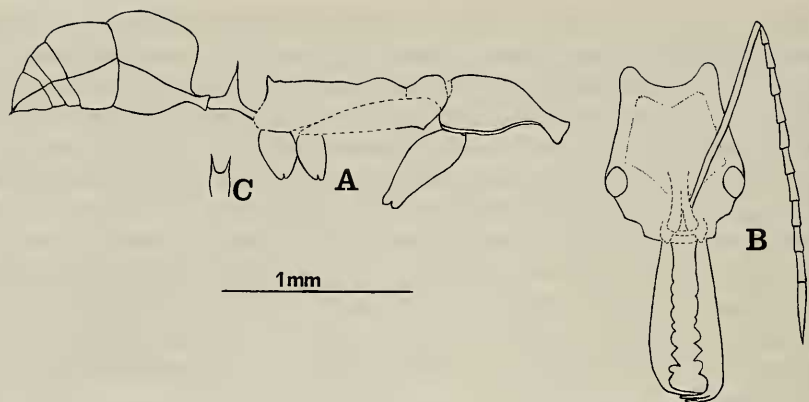


Fig. 16. *Anochetus intermedius* n. sp. Worker, holotype. Lateral view (A), full frontal view of the head (B) and petiole (C). Appendages omitted.

Worker (Fig. 16): Measurements (in mm) and indices: TL 4.56; HL 0.80; HW 0.68; ML 0.84; SL 1.08; eye maximum width 0.16; WL 1.44; petiole maximum length 0.32; CI 85; MI 105; SI 158.8.

Description. — Head narrow posteriorly, less than $\frac{1}{4}$ longer than broad. Eyes as long as the maximum width of the mandibles with teeth. Scapes passing the posterior margin of the head ca. six times their maximum width, and less than half longer than head length. Mandibles $\frac{1}{4}$ longer than the head width, and slightly longer than the head length; the mandibular blades slightly enlarging from the base to the apex; the masticatory borders have 8 teeth on the right and 7 teeth on the left, decreasing in size basad; mandibular apex consisting of three slender teeth, the apical and subapical subequal in size, and the intercalary is half the length of the other two.

Trunk slender, slightly shorter than the length of the head including the mandibles. Pronotum slightly convex. Mesonotum convex. Propodeal dorsum convex anteriorly, and straight posteriorly. Anteroventral margin of the mesopleura with a developed triangular lobe. Propodeal spines 0.04 mm long.

Sides of the petiolar node slightly convex; petiolar spines slender and 0.12 mm long.

First gastric segment straight anteriorly, the remaining tergum and sternum convex.

Sculpture: frons and posterior portion of the antennal fossae longitudinally striate. The posterior fourth of the cephalic dorsum, the anterior portion of the antennal fossae, mandibles, center of the pronotum and of the mesopleura, petiole and gaster shining and punctate, giving a slightly opaque aspect. Pronotum with weak irregular striae. Mesonotum, propodeum, mesopleural borders and propodeal pleurae transversally striate and punctate as is most of the cephalic dorsum. Legs and antennae opaque and coarsely punctate. Coarse, longitudinal striae are visible on the mesonotum. Similar but irregular striae can be recognized on the pronotum, petiole and gaster. It is probable that this striation results from dorsoventral and lateral compressions of the specimen.

Pilosity: body with sparse, short, appressed, fine, pointed hairs. Several pairs of erect, thick pointed hairs 0.16 mm long are present as follows: one on the dorsum of

the antennal scrobes; one on the posterior portion of the antennal fossae, and one on the anterior portion of the pronotal disc. On the gaster the hairs are sparse and 0.08–0.16 mm long; and on the coxae and femora the hairs are rare, suberect and 0.08–0.12 mm long. Ventral face of the mandibles with three pairs of hairs before the apical teeth. Sides of the apical teeth with 4 pairs of subdecumbent, pointed hairs 0.08 mm long.

Colour: head, antennae, mandibular apex, tibiae and tarsi brownish; thorax, petiole, and gaster castaneous-yellow; mandibular blades, coxae, trochanters, and femora yellowish.

Relationships. — *A. intermedius* falls within the *inermis* group using the key of BROWN (1978) for the Neotropical species. The characters shared by *intermedius* and the species of this group (*inermis*, *simoni*, *diegensis*, and *targionii*) are small size and small eyes. Assuming that the reduced size assigning this species to the *inermis* group is a secondary adaptation relatively unimportant in *Anochetus* evolution, *A. intermedius* could be attributed to the *emarginatus* group of BROWN (1978) for its long petiolar spines and small but developed propodeal spines similar to *kempfi* assigned to the latter group. The long petiolar spines, the prominent propodeal spines, and the mandibles with 7–8 teeth equally suggest that *intermedius* may be close to *kempfi*. The main apomorphy of *intermedius* is the length of the mandibles slightly longer than the head length. *Intermedius* as its name means, appears to be intermediate between members of the *emarginatus* and of the *inermis* groups.

Some different manifestations of a morphological syndrome apparently intermediate between the two Recent species groups *emarginatus* and *inermis* are found not only in *intermedius* but in two other new fossil species to be described latter in this paper. Some caution should be exerted in further use of species groups as currently defined for Neotropical *Anochetus*.

Anochetus dubius n. sp.

Fig. 17

Holotype: Worker (unique) in the amber sample Do-4192 from the collection of the State Museum of Natural History, Stuttgart (Department of Phylogenetic Research).

Derivatio nominis: From the Latin *dubius* (= doubtful) referring to its probable phylogenetic relationships to Recent *Anochetus* species groups.

Diagnosis. — An *Anochetus* species immediately separable from known species for the following character combinations: medium-size, stout petiolar node bearing a developed spine, propodeal spines short, mandibles with 10 teeth, and posterior fourth of the cephalic capsule shining.

Worker (Fig. 17). Measurements (in mm) and indices: TL 5.25; HL 1.12; HW 0.88; ML 0.84; SL 1.20; eye maximum width 0.24; WL 1.64; petiole maximum length 0.33; CI 78.6; MI 75.0; SI 136.4.

Description. — Head narrow posteriorly, slightly more than $\frac{1}{4}$ longer than broad. Eyes as long as the maximum width of the mandibles including the teeth. Scapes passing the posterior margin of the head by ca. six times their maximum width. Mandibles slightly shorter than the head width, and $\frac{1}{4}$ shorter than the head length; the mandibular blades gradually widening from the base to the apex; the masticatory borders with 10 teeth and denticles, decreasing in size basad; the mandibular apex consists of three slender teeth, the apical and subapical teeth equal in size, and the intercalary tooth half the size of the other two.

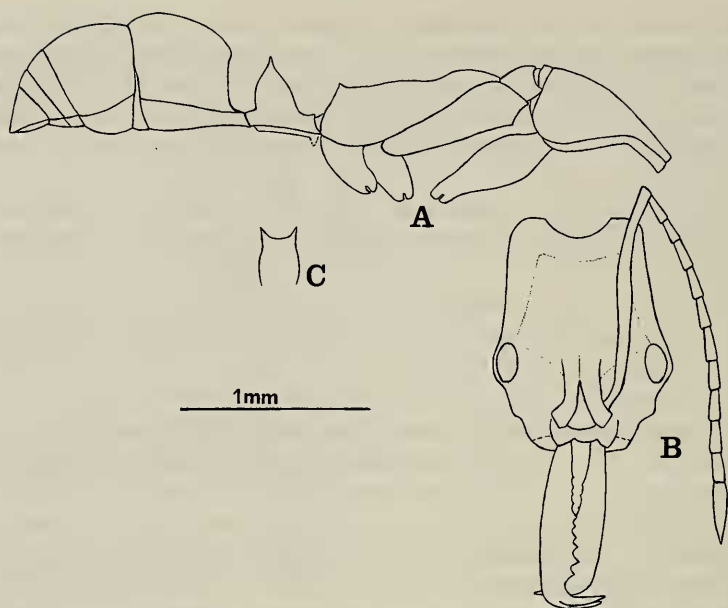


Fig. 17. *Anochetus dubius* n. sp. Worker, holotype. Lateral view (A), full frontal view of the head (B) and petiole (C). Appendages omitted.

Trunk slender, $\frac{1}{3}$ longer than the head length. Pronotum and mesonotum convex in side view. Anteroventral margin of the mesopleura with a small triangular lobe. Propodeal dorsum with two convexities, one high on the anterior part and the other low on the median part; posterior part straight. Propodeal spines short, 0.04 mm long.

Petiolar node in side view with convex anterior and posterior faces; the petiolar spines slender, 0.10 mm long. Ventral process of the petiole anterior.

First gastric segment straight anteriorly, remaining tergum convex and sternum straight.

Sculpture: frons and posterior portion of the antennal fossae longitudinally striate and weakly punctate. The posterior fourth of the cephalic dorsum, the anterior portion of the antennal fossae, mandibles, center of the mesopleura, petiole and gaster shining and with sparse punctuations. Pronotum, mesonotum and anterior part of propodeal dorsum coarsely reticulo-striate. Median and posterior parts of propodeal dorsum with transverse irregular striae. Mesopleural borders and ventral part of the sides of the propodeum transversally striate. Upper side of the propodeum feebly striate and slightly shining. Petiolar node posteriorly and ventrally with weak horizontal striae. Coxae, trochanters, and proximal half of the femora slightly shining and minutely punctate. Antennae, distal half of the femora, tibiae, and tarsi opaque and strongly punctate.

Pilosity: body with sparse, short, appressed, fine, pointed hairs. Erect, thick pointed hairs as follows: a pair 0.12 mm long on the posterior portion of the antennal fossae; a pair 0.20 mm long on the anterior portion of the pronotal disc; on the gaster the hairs are sparse and 0.12–0.20 mm long; on the coxae and femora the hairs are

rare, suberect and 0.08–0.12 mm long. Ventral face of the mandibles with hairs disposed as follows: a pair 0.52 mm long close to the base, and two pairs before the apical teeth. Sides of the apical teeth with 4 pairs each of subdecumbent, pointed hairs 0.12 mm long.

Colour: body brown, with slightly darker head and gaster. Coxae, trochanters, and proximal half of the femora reddish.

Relationships. — *A. dubius* appears to be intermediate between members of the Recent *emarginatus* and *inermis* species groups. The following Table summarizes the main similarities and differences among the most probably related species. Measurements based on BROWN's text and drawings (1978) for *kempfi* and *simoni*, and on MACKAY's drawing (1991) for *brevidentatus*.

	<i>dubius</i>	<i>simoni</i>	<i>kempfi</i>	<i>brevidentatus</i>	<i>intermedius</i>
Posterior fourth of the cephalic dorsum	shining	opaque	shining	shining	shining
Mandibular dentition	10	9–10	7–9	6	7–8
Length of the petiolar spines (mm)	0.10	0.06	0.20	0.07	0.12
Length of the propodeal spines (mm)	0.04	short	0.08	0.05	0.04

For the difficulties on assignment of this and the next species, see the discussion under *intermedius*.

Anochetus ambiguus n. sp.

Fig. 18

Holotype: Worker in the amber sample Do-3346 from the collection of the State Museum of Natural History, Stuttgart (Department of Phylogenetic Research).

Paratype: Worker in the amber sample 4015 and deposited in the same collection as the holotype.

Derivatio nominis: From the Latin *ambiguus* (= variable, uncertain).

Diagnosis. — An *Anochetus* belonging to the *haytianus* superspecies, close to the Recent *kempfi* and to the fossil *brevidentatus*, differing from the first species for its short petiolar and propodeal spines; and from the second for its long petiolar spines, and for the mandibles with 7–9 teeth instead of 6; and from both of them for its small size and dark colour.

Worker (Fig. 18): Measurements (in mm) and indices: TL holotype 5.64, paratype 5.92; HL holotype 1.20, paratype 1.24; HW holotype 0.96, paratype 0.88; ML holotype 0.92, paratype 1.00; SL holotype 1.28, paratype 1.24; eye maximum length holotype and paratype 0.24; WL holotype 1.88, paratype 1.96; petiole maximum length holotype and paratype 0.40; CI holotype 80, paratype 71; MI holotype 76.6, paratype 80.6; SI holotype 133.3, paratype 141.0.

Description. — Head narrow posteriorly, less than $\frac{1}{3}$ longer than broad. Eyes as long as the maximum width of the mandibles including the teeth. Scapes passing the posterior margin of the head of ca. two times their maximum width. Mandibles slightly shorter than the head width, and $\frac{1}{3}$ shorter than the head length; mandibular blades gradually widening from the base to the apex; the masticatory borders have 9 teeth on the right and 7 teeth on the left, decreasing in size basad; mandibular apex consists of three long, slender teeth.

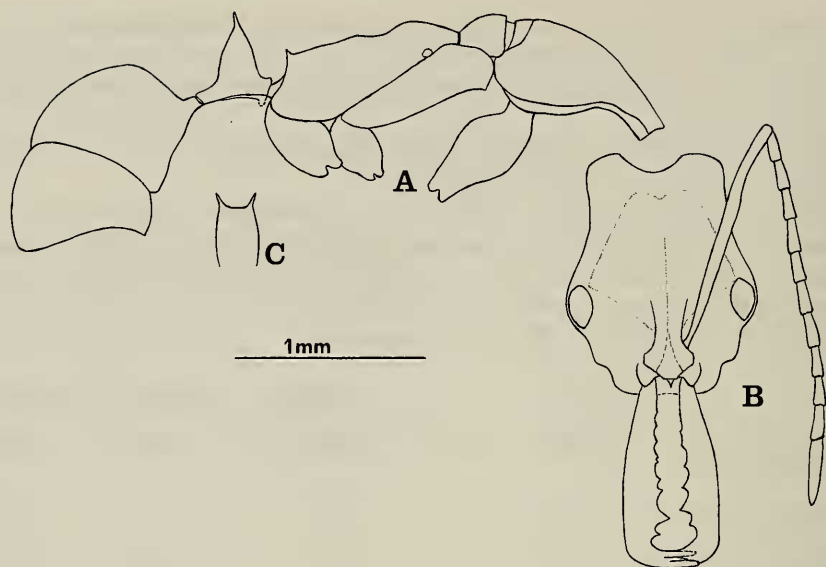


Fig. 18. *Anochetus ambiguus* n. sp. Worker, holotype. Lateral view (A), full frontal view of the head (B) and petiole (C). Appendages omitted.

Trunk slender, $\frac{1}{3}$ longer than the head length. Pronotum and mesonotum convex in side view. Anteroventral margin of the mesopleura with a small triangular lobe. Propodeal dorsum with two convexities, one high on the anterior part, and the other low on the median part; posterior part almost straight. Propodeal spines short, 0.04 mm long.

Petiolar node in side view with the anterior and posterior faces slightly convex. Petiolar spines slender, 0.10 mm long. Ventral process of the petiole anterior.

First gastric segment straight anteriorly, remaining tergum convex, sternum straight.

Sculpture: frons and posterior portion of the antennal fossae longitudinally striate and with sparse and coarse punctuations. The posterior fourth of the cephalic dorsum, the anterior portion of the antennal fossae, mandibles, center of the mesopleura, and gaster shining and sparsely punctate. Disc of the pronotum with faint circular striae, its center shining and weakly punctate. Pronotal sides longitudinally striate. Mesonotum, borders of the mesopleura, and propodeal sides transversally striate. Propodeal dorsum and neck with irregular transverse striae and coarse punctuations. Petiolar node posteriorly and ventrally with weak horizontal striae. Coxae, trochanters, proximal half of the femora and petiole slightly shining and minutely punctate; distal half of the femora, tibiae, tarsi, and antennae opaque and strongly punctate.

Pilosity: body with sparse, short, appressed, fine, pointed hairs. Erect, thick pointed hairs placed as follows: a pair 0.16 mm long on the dorsum of the antennal fossae; a pair 0.20 mm long on the anterior portion of the pronotal disc; sparse and 0.16–0.20 mm long on the gaster; rare, suberect and 0.12–0.16 mm long on the coxae and femora. Ventral face of the mandibles with hairs disposed as follows: a pair 0.68 mm long close to the base, and three pairs before the apical teeth. Sides of the apical teeth with 4–5 pairs of subdecumbent, pointed hairs 0.12 mm long.

Colour: castaneous to dark brown and slightly shining. Coxae, trochanters, proximal half of the femora and petiole reddish.

Paratype. — It differs from the holotype for its larger size, for the right mandible bearing eight teeth instead of 9, for the stronger pronotal disc sculpture, and for its darker colour. Minute and dense punctuations cover the dorsum of the first and part of the second gastric segments giving a opaque aspect as opposed to sparse punctuations and shining in the holotype. This sculpture may result from deterioration of the specimen. For this reason I did not consider these characters shown by the paratype sufficient to describe it as new species.

Relationships. — *A. ambiguus* appears to be intermediate between the two Recent species groups *emarginatus* and *inermis*. *A. ambiguus* falls within the *inermis* group using the key of BROWN (1978) for the Neotropical species. But its slender body, and developed petiolar spines show more affinities with *kempfi* and *brevidentatus* of the *emarginatus* group. *A. ambiguus* differs from *kempfi* by its short propodeal and petiolar spines, and from *brevidentatus* for the long petiolar spines and for the mandibles with 7–9 teeth instead of 6. Besides the characters just mentioned, *ambiguus* differs from both these species groups for its small size and dark body.

Only three Recent *Anochetus* species are known from Hispaniola: *haytianus*, *longispina*, and *mayi*. Two other fossil *Anochetus* are known from the Dominican Republic besides these described in the present paper: *corayi* described from a unique gyne by BARONI URBANI (1980) and close to the Recent *mayri*, and *brevidentatus* described from a unique worker by MACKAY (1991) who stated that *brevidentatus* is close to *kempfi* but could also be attributed to the *inermis* group for its denticular configuration, small eyes, teeth on the petiolar node, and small size.

For the difficulties in group assignment of this species and other fossil species, see the discussion under *intermedius*.

Anochetus brevidentatus MACKAY

A. brevidentatus MACKAY, 1991, J. New York entomol. Soc., 99 (1): 138.

Material examined: a worker in the amber sample Do-3968 of the collection of the State Museum of Natural History, Stuttgart (Department of Phylogenetic Research).

Measurements (in mm) and indices: TL 6.08; HL 1.32; HW 1.00; ML 0.92; SL 1.40; eye maximum width 0.20; WL 2.00; petiole maximum length 0.36; CI 75.7; MI 69.7; SI 140.

I attribute this specimen to *brevidentatus*, though its right mandible appears to have one tooth more than in the description of *brevidentatus* published by MACKAY (l. c.); also the petiolar spines are slightly longer. In spite of the small differences between the two specimens, I see no reason to add another specific name for the specimen available for the present study since, in addition to normal interspecific variability as already known for the genus, a certain amount of allochrony between the specimen described by MACKAY (1991) and this one can easily be assumed. In this case the fossil is the second known specimen of *brevidentatus*.

Anochetus lucidus n. sp.

Fig. 19

Holotype: Worker in the amber sample Do-2846-1 of the collection of the State Museum of Natural History, Stuttgart (Department of Phylogenetic Research).

Paratype: Worker in the amber sample Do-2846-2 and deposited in the same collection as the holotype.

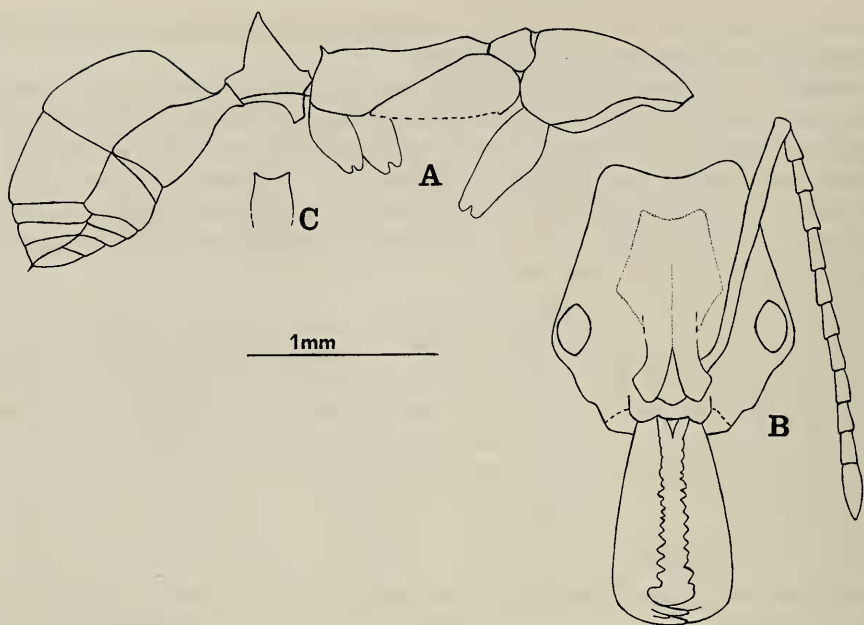


Fig. 19. *Anochetus lucidus* n. sp. Worker. Lateral view, paratype (A). Full frontal view of the head (B) and petiole (C), holotype. Appendages omitted.

Derivatio nominis: From the Latin *lucidus* (= shining)

Diagnosis. — An *Anochetus* in which the worker differs from all known Neotropical species for the following characters: long and broad mandibles bearing 15 teeth, propodeal spines developed, smooth and shining integument.

Worker (Fig. 19; head and petiole drawn after the holotype, thorax and gaster drawn after the paratype). Measurements (in mm) and indices: TL holotype 5.88, paratype 5.72; HL holotype 1.32, paratype 1.28; HW holotype 1.20, paratype 1.16; ML holotype 1.00, paratype 0.96; SL holotype 1.36, paratype 1.32; eye maximum width holotype 0.30, paratype 0.29; WL holotype 1.80, paratype 1.68; petiole maximum length holotype and paratype 0.44; CI holotype 90.9, paratype 90.6; MI holotype 75.7, paratype 75.0; SI holotype 133.3, paratype 133.8.

Description. — Head narrow posteriorly, very broad at the level of the eyes, and slightly longer than broad. Eyes longer than the maximum width of the mandibles teeth included. Scapes passing the posterior margin of the head by ca. three times their maximum width. Mandibles shorter than the head width and with very broad blades; the masticatory borders have 15 teeth and denticles decreasing in size basad; mandibular apex consisting of three teeth; the apical and subapical teeth equal in size, and the intercalary tooth half of the length other two.

Trunk slender, $\frac{1}{3}$ longer than the head length. Pronotum and mesonotum broad and slightly convex in side view. Anteroventral margin of the mesopleura with a small triangular lobe. Propodeal dorsum with two convexities, one high on the anterior part and the other low on the posterior part; median part slightly concave. Propodeal spines well developed, 0.08 mm long.

Petiolar node with the anterior face straight posterior and lateral faces slightly convex. Petiolar spines short, with subobtusate teeth. Ventral process of the petiole anterior.

First gastric segment with the anterior face straight, its tergum and sternum slightly convex.

Sculpture: frons, posterior third of the antennal fossae up to the beginning of the posterior fourth of the cephalic dorsum longitudinally striate with the striae converging anteriorly and with fine, sparse punctures. Posterior fourth of the cephalic dorsum, anterior and most of the posterior portion of the antennal fossae, sides of the head, mandibles, pronotum, mesopleura, most of the propodeal sides, petiole and gaster shining and with sparse, minute piligerous fossae slightly larger on the dorsum of the head and mandibles. Mesonotum with few and feeble transverse striae on the sides and shining. Anterior third of the propodeal dorsum with irregular transverse striae and punctate; the remaining parts of the propodeum including the propodeal spines, the propodeal declivity, and the posterior border of the propodeal sides with weak transverse striae and slightly shining. Coxae, trochanters, proximal half of the femora slightly shining and minutely punctate; distal half of the femora, tibiae, tarsi and antennae opaque and strongly punctate.

Pilosity: body with sparse, short, appressed, pointed hairs arising from the center of the piligerous fossae. Erect, thick pointed hairs present as follows: dorsum of the antennal scrobes with two pairs 0.12 mm long on its median and posterior sides; posterior portion of the antennal fossae and anterior portion of the pronotal disc with a pair, 0.20 mm long; sparse and 0.16–0.20 mm long on the gaster; rare, sub-erect and 0.12 mm long on the coxae and femora. Ventral face of the mandibles with hairs disposed as follows: a pair 0.8 mm long close to the base, and three pairs before the apical teeth. Sides of the apical teeth with 3–4 pairs of subdecumbent, thick, pointed hairs 0.08 mm long.

Colour: red-brownish and shining, trunk and legs slightly castaneous.

Paratype. — It differs from the holotype for its smaller size, for the weaker striae on the sides of the mesonotum, for the more slightly protruding petiolar spines, and for the more reddish colour of the trunk and legs.

Relationships. — *A. lucidus* shares with the Recent *orchidicola* (BROWN, 1978, known only from an orchid root of Mexican origin) the smooth and shining integument and broad head, but differs from it as follows: long and broad mandibles bearing 15 teeth in *lucidus* vs. short and thick mandibles with inner borders straight in *orchidicola*; propodeum with developed spines in *lucidus* vs. a propodeal dorsum without spines in *orchidicola*; petiolar spines short but with a subobtusate tooth in *lucidus* vs. petiolar node with rounded crest in *orchidicola*; eye length 0.29–0.30 mm in *lucidus* vs. eye length 0.12 mm in *orchidicola*; scapes passing the posterior margin of the head in *lucidus* vs. scapes not reaching the posterior margin of the head in *orchidicola*. *A. orchidicola* belongs to the species group *altisquamis* of BROWN (l. c.) including only *altisquamis* (SE. Brazil, N. Argentina, and Uruguay) and *orchidicola*. The former species differs from both *lucidus* and *orchidicola* for its body in part striolate and only slightly shining.

A. lucidus, in addition, shares its shining integument, large eyes and broad vertex with many species of different currently recognized species groups from different zoogeographical regions mainly with the *rectangularis* group from Australia. This would suggest a rather weak phylogenetic importance for these characters which are likely to have been convergently selected many times. For the time being, I shall consider *lucidus* as a member of the *altisquamis* group in spite of the numerous differences with the two other species previously assigned to this group.

Anochetus conisquamis n. sp.

Fig. 20

Holotype: Worker (unique) in the amber sample Do-3955 from the collection of the State Museum of Natural History, Stuttgart (Department of Phylogenetic Research).

Derivatio nominis: From the Latin *conicus* (= cone shape) and *squama* (= scale).

Diagnosis. — An *Anochetus* species unique for the following character combination: conical petiole bearing a nipple-shaped apex, mandibles with a single inner margin with 10 teeth, mesonotal disc with a low rim raised anteriorly, propodeal angle with a short spine, and body dark brown to black.

Worker (Fig. 20): Measurements (in mm) and indices: TL 5.48; HL 1.08; HW 0.88; ML 0.84; SL 1.20; eye maximum length 0.19; WL 1.84; petiole maximum length 0.36; CI 81.5 MI 77.7; SI 136.4.

Description. — Head slightly narrow posteriorly, longer than broad. Eyes as long as the maximum width of the mandibles with teeth. Scapes passing the posterior margin of the head by ca. two times their maximum width. Mandibles slightly shorter than the head width, and less than $\frac{1}{4}$ shorter than the head length; mandibular blades gradually enlarging from the base to the apex; the masticatory borders have 10 teeth and denticles, decreasing in size basad; mandibular apex consisting of three slender teeth, the subapical slightly longer than the apical, and the intercalary tooth half of the length of the apical tooth.

Trunk slender, as long as the sum of the length of the head and mandibles. Pronotum convex. Mesonotum with a low anterior rim and declivous in side view. Anteroventral margin of the mesopleura with a developed triangular lobe. Propodeal dorsum with two convexities, one high on the anterior part, and the other low on the median part; posterior part straight. Propodeal spines 0.04 mm long.

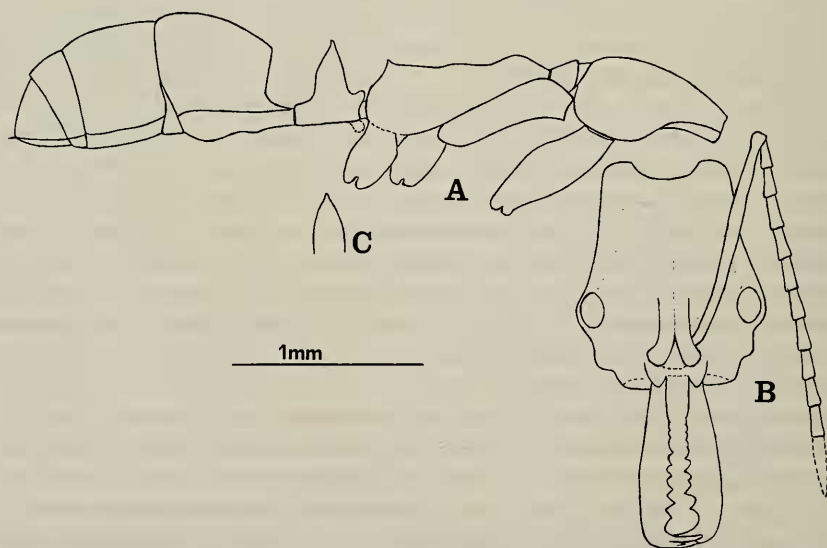


Fig. 20. *Anochetus conisquamis* n. sp. Worker, holotype. Lateral view (A), full frontal view of the head (B) and petiole (C). Appendages omitted.

Petiolar node unispinose and conical in side view. The apex is drawn out and blunt on a narrow tip in frontal view. Ventral process of the petiole anterior.

Anterior face of the first gastric segment straight, its dorsum and sternum convex, and its sides slightly convex.

Sculpture: frons and posterior portion of the antennal fossae longitudinally striate. The posterior fourth of the cephalic dorsum, the anterior portion of the antennal fossae, mandibles, center of the mesopleura, and petiole shining and sparsely punctate. Pronotum and ventral side of the petiolar node with irregular longitudinal striae, weak on the pronotal center which appears slightly shiny. Mesonotum and propodeum with transverse striae superimposed on irregular striae. Mesopleural borders and propodeal sides transversally striate. Gastric dorsum finely punctate and shining, the first two segments, in addition, show a very superficial, broad reticulation. Coxae, trochanters, and proximal half of the femora slightly shining and minutely punctate; distal half of the femora, tibiae, tarsi, and antennae opaque and strongly punctate.

Pilosity: body with sparse, short, appressed, fine, pointed hairs. Erect, thick pointed hairs present as follows: a pair 0.16 mm long on the posterior portion of the antennal fossae, a pair on the anterior portion of the pronotal dorsum; sparse and 0.12–0.17 mm long on the gaster; rare, suberect and 0.12 mm long on the coxae and femora. Ventral face of the mandibles with hairs disposed as follows: a pair close to the base, and three pairs before the apical teeth. Sides of the apical teeth with 4 pairs of subdecumbent, pointed hairs 0.08 mm long.

Colour: head capsule, mandibles, antennae, thorax, gaster, distal half of the femora, tibiae, tarsi, and ventral third of the petiolar node dark brown to black; propodeal declivity, coxae, trochanters, proximal half of the femora, tibiae, and the remaining $\frac{2}{3}$ of the petiolar node yellow-reddish.

Relationships. — This species is particularly remarkable for its conical petiole with an extended apex. A conical petiolar node with a blunt extended apex is present in the members of the *cato* species group. *A. cato* known from New Guinea, the Bismarck Archipelago and Salomon Is., is the closest species of *conisquamis*. The two species are easily separable for the following important differences: mandibles with a single inner margin bearing 10 acute teeth or denticles in *conisquamis* vs. mandibles with two margins with the upper one edentate and the lower smooth or crenulate in *cato*; mesonotal disc with low anterior rim in *conisquamis* vs. mesonotal disc with blunt anterior rim in *cato*; thorax with a single pair of erect hairs on the pronotum in *conisquamis* vs. thorax with sparse erect hairs in *cato*; anterior part of the pronotum without costulae in *conisquamis* vs. anterior part of the pronotum costulate in *cato*; pronotum with irregular longitudinal striae in *conisquamis* vs. pronotum shining in *cato*. In spite of these differences, the fact remains that a conical petiole is known only from species of the Indomalayan region among the Recent species. A faunal relationship between the Dominican amber and the present Indomalayan ants has already been reported for the fossil *Ilemomyrmex* which resembles the Recent genus *Calyptomyrmex* (WILSON, 1985a). In addition I have other still unpublished examples in the material available to me. For these reasons a synapomorphic value of the petiolar shape and hence a direct faunal relationship between the fossil Dominican and Recent Indomalayan ant biota is possible.

Anochetus corayi BARONI URBANI

A. corayi BARONI URBANI, 1980b, Stuttgarter Beitr. Naturk., B, 55: 2.

Material: Known only from the holotype, deposited in the Stuttgart Museum and not re-examined for the present study.

This was the first fossil *Odontomachiti* and has been described from Dominican amber by BARONI URBANI (1980 b). I concur with BARONI URBANI (l. c.) in attributing this species to the *A. mayri* species group, a small, exclusively Neotropical group of species common today on Hispaniola and on other Caribbean islands.

4. Key for the identification of the fossil *Odontomachiti*

All *Odontomachiti* known from the fossil record, till now, are represented by worker or gynes in Dominican amber and are dealt with in this paper. A practical key for their identification is presented in the following.

1. Nuchal carina V-shaped (*Odontomachus*) 2
- Nuchal carina U-shaped (*Anochetus*) 3
2. Striation of the cephalic dorsum reaching almost to the nuchal carina. . . *O. pseudobauri*
- Striation of the cephalic dorsum not extending further than the anterior half of the head *O. spinifer*
3. Mesial border of mandibles without teeth *A. corayi*
- Mesial border of mandibles toothed 4
4. Petiolar apex unispinose *A. conisquamis*
- Petiolar apex bispinose 5
5. Mesial border of mandibles with 6 teeth *A. brevidentatus*
- Mesial border of mandibles with 7 or more teeth 6
6. Mesial border of mandibles with 7–9 teeth 7
- Mesial border of mandibles with 10 or more teeth 8
7. TL 4.56, mandibles $\frac{1}{4}$ longer than the head width *A. intermedius*
- TL 5.64–5.92, mandibles slightly shorter than the head width *A. ambiguus*
8. Mesial borders of mandible with 10 teeth *A. dubius*
- Mesial borders of mandible with 12 or 15 teeth 9
9. Mesial border of mandibles with 12 teeth *A. exstinctus*
- Mesial border of mandibles with 15 teeth *A. lucidus*

5. Discussion

BROWN (1976) recognizes 23 species of *Odontomachus* and 20 species of *Anochetus* in the New World. Of these, three species of *Odontomachus* (*bauri*, *insularis*, and *brunneus*) and five species of *Anochetus* (*haytianus*, *inermis*, *longispina*, *mayri*, and *testaceus*) have been reported from the Caribbean islands. The Recent *Odontomachiti* known from the island of Hispaniola are: *Odontomachus bauri* and *O. insularis*, with the second species endemic to the Greater Antilles; *Anochetus haytianus* and *A. longispina* are endemic of Hispaniola and *mayri* also occurs on the island but is more widespread in the Neotropical region.

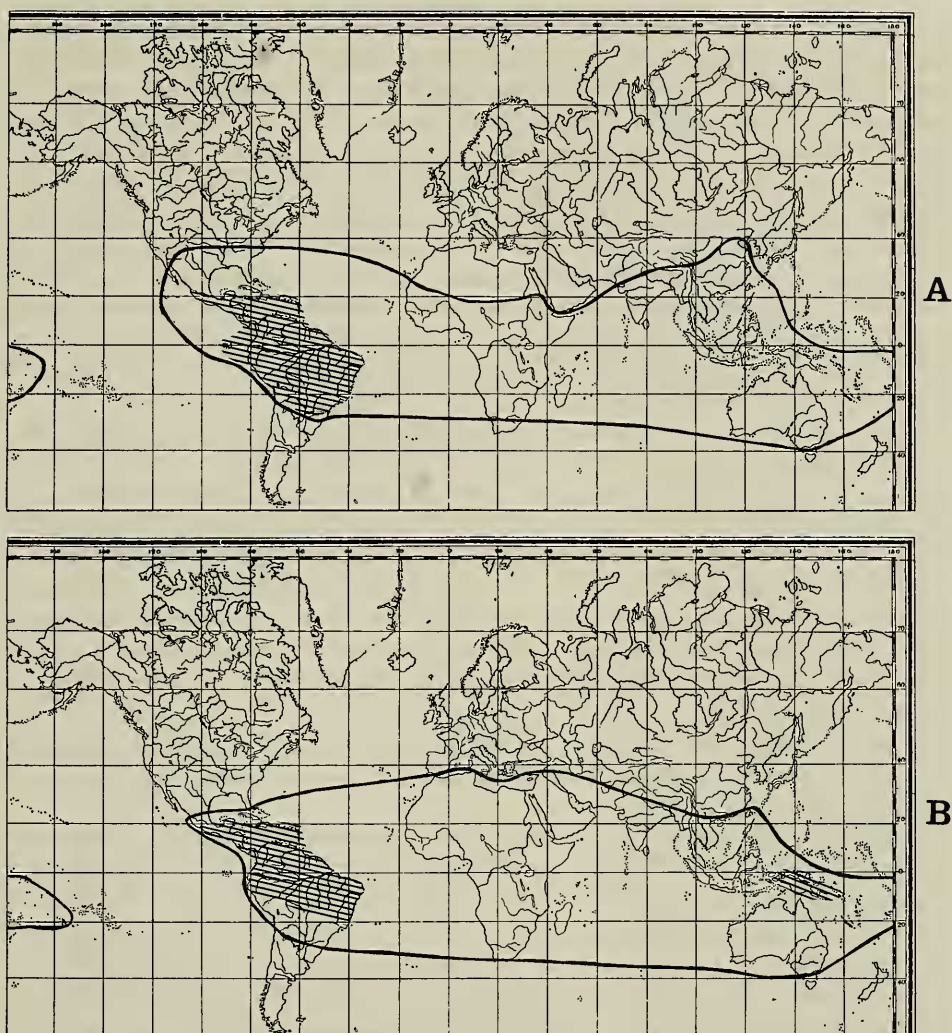


Fig. 21. Known distribution of the genera *Odontomachus* (A), and *Anochetus* (B). The shaded area represents the distribution of the Recent species closely related to the amber fossils.

The fossil *Odontomachus spinifer* described in this paper belongs to the *haematodus* subgroup as defined by BROWN (l. c.) which includes *affinis*, *mayi* and *panamensis* ranging from Central to South America. *O. pseudobauri* is very close to the Recent *bauri* which has a wider Neotropical distribution. The know distribution of the genus *Odontomachus* is given in Fig. 21A. The shaded area represents the distribution of the Recent species closely related to the amber fossils. There appears to be no differences in the number of species between the amber and Recent *Odontomachus* fauna composition of the island Hispaniola, but only small qualitative differences implying a relatively small amount of migration to or exchange with the South American mainland.

Out of the six fossil Dominican *Anochetus* described in this paper, four (*extinctus*, *ambiguus*, *intermedius*, and *dubius*) share many characters with species distributed either in Central and/or South America. Among these four species, *extinctus* is the only one which can be attributed without doubt to a Recent species group as defined by BROWN (1978). The other three, show a mixture of characters which have been considered to characterize different species groups based on neontological material. Another species, *A. lucidus*, shares a smooth and shining integument and broad head with a Central American species, *A. orchidicola*, but also shares several characters with many different species groups from the Old World. *A. conisquamis* is probably the most remarkable species since its petiolar morphology would indicate a relationship with *A. cato* from the Oceanian region. The known distribution of the genus *Anochetus* is given in Fig. 21B. The shaded area represents the distribution of the Recent species closely related to the amber fossils.

In addition to the six species of fossil *Anochetus* described in the present paper, two more have been described from the Dominican amber fauna in the works of BARONI URBANI (1980b) and MACKAY (1991): *A. corayi* and *A. brevidentatus*. Thus the *Anochetus* ant fauna contrasts sharply with that of *Odontomachus* in two important respects. First, the Recent representatives of the latter genus exhibit a greater specific diversity than the Recent *Anochetus* in the Neotropics (but not in the rest of the world). Second, the amber fauna shows a greater species number for *Anochetus* than for *Odontomachus*. Together, these two points indicate a high extinction rate or a large extinction event for *Anochetus*, but not for *Odontomachus*, between the fossil period and the present.

POINAR (1992) estimates the age of Dominican ambers as ranging between 15 and 40 million years, depending on the mining site, placing most amber species in the Oligocene/Miocene periods.

According to WARD (1992) the diversity of *Pseudomyrmex* fauna in Dominican amber was much richer during the Oligocene-Miocene times than today. For example, the eleven *Pseudomyrmex* species described by WARD (l. c.) cannot be placed in any of the modern species groups. He supposes that drastic changes in insularity and temperature should be regarded as the cause of such extinction.

The decline of *Anochetus* fauna in Hispaniola reinforces the evidence that drastic changes occurred in Hispaniola since Oligocene/Miocene times. A drastic change in temperature is supported if one considers that *Pseudomyrmex* is an arboreal genus while *Anochetus* is essentially terricolous. Oddly, *Odontomachus*, the other terricolous genus dealt with in this paper, appears to have been much less affected by the paleobiological changes which have intervened since Oligocene-Miocene times.

Moreover, the *Anochetus* fauna appears to be much less closely related to the contemporary Neotropical species than the two *Odontomachus* species, indicating perhaps a larger degree of migration for *Anochetus*.

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7. References

- ANDRADE, M. L. DE (1992): First fossil "true *Macromischa*" in Amber from the Dominican Republic (Hymenoptera, Formicidae). — Bull. Soc. ent. Suisse, 65: 341–351; Lausanne.
- BARONI URBANI, C. (1980): First description of fossil gardening ants (Amber Collection Stuttgart and Natural History Museum Basel; Hymenoptera: Formicidae. I: Attini) — Stuttgarter Beitr. Naturk., B, 54: 1–13; Stuttgart. — [1980a]
- (1980): *Anochetus corayi* n. sp., the first fossil Odontomachiti ant (Amber Collection Stuttgart: Hymenoptera, Formicidae. II: Odontomachiti). — Stuttgarter Beitr. Naturk., B, 55: 1–6; Stuttgart. — [1980b]
- (1980): The first species of the Australian ant genus *Leptomyrmex* in amber from the Dominican Republic (Amber Collection Stuttgart: Hymenoptera, Formicidae. III: Leptomyrmecini). — Stuttgarter Beitr. Naturk., B, 62: 1–10; Stuttgart. — [1980c]
- (1980): The ant genus *Gnamptogenys* in Dominican Amber (Amber Collection Stuttgart: Hymenoptera, Formicidae. IV: Ectatommini). — Stuttgarter Beitr. Naturk., B, 67: 1–10; Stuttgart. — [1980d]
- (1994): The Identity of the Dominican *Paraponera* (Amber Collection Stuttgart: Hymenoptera, Formicidae. V: Ponerinae, partim). — Stuttgarter Beitr. Naturk., B, 197: 1–9; Stuttgart.
- BARONI URBANI, C. & DE ANDRADE, M. L. (1994): First description of fossil Dacetini ants with a critical evaluation of the current classification of the tribe (Amber Collection Stuttgart: Hymenoptera, Formicidae. VI: Dacetini). — Stuttgarter Beitr. Naturk., B, 198: 1–65; Stuttgart.
- BARONI URBANI, C. & SAUNDERS, J. B. (1982): The fauna of the Dominican Republic amber: The present status of knowledge. — Trans. IXth Caribbean geol. Conf., Santo Domingo, Dominican Republic, 1: 213–223; Santo Domingo/Dominican Republic.
- BARONI URBANI, C. & WILSON, E. O. (1987): The fossil members of the ant tribe Leptomyrmecini (Hymenoptera: Formicidae). — Psyche, 94: 1–8; Cambridge/Mass.
- BROWN, W. L., JR. (1976): Contributions toward a Reclassification of the Formicidae. Part VI. Ponerinae, Tribe Ponerini, Subtribe Odontomachiti. Section A. Introduction, Subtribal Characters. Genus *Odontomachus*. — Studia ent., 19: 67–171; Petrópolis/Brazil.
- (1978): Contributions toward a Reclassification of the Formicidae. Part VI. Ponerinae, Tribe Ponerini, Subtribe Odontomachiti. Section B. Genus *Anochetus* and Bibliography. — Studia ent., 20: 549–638; Petrópolis/Brazil.
- LATKE, J. E. (1990): The genus *Proceratium* Roger in Dominican Amber (Hymenoptera: Formicidae). — Caribbean J. Sci., 26: 101–103; Mayagüez/Puerto Rico.
- MACKAY, W. P. (1991): *Anochetus brevidentatus*, new species, a second fossil Odontomachiti ant (Hymenoptera: Formicidae). — J. New York ent. Soc., 99: 138–140; New York.
- POINAR, G. O., JR. (1992): Life in amber. 350 pp., 8 pls.; Stanford/California (Stanford University Press).
- SCHLEE, D. & GLÖCKNER, W. (1978): Bernstein. — Stuttgarter Beitr. Naturk., C, 8: 1–72, 16 pls.; Stuttgart.
- WARD, P. S. (1992): Ants of the genus *Pseudomyrmex* (Hymenoptera: Formicidae) from Dominican amber, with a synopsis of the extant Antillean species. — Psyche, 99: 55–85; Cambridge/Mass.
- WILSON, E. O. (1985): Ants of the Dominican amber (Hymenoptera: Formicidae). 1. Two new myrmecine genera and an aberrant *Pheidole*. — Psyche, 92: 1–9; Cambridge/Mass. — [1985 a]
- (1985): Ants of the Dominican amber (Hymenoptera: Formicidae). 2. The first fossil army ants. — Psyche, 92: 11–16; Cambridge/Mass. — [1985 b]
- (1985): Ants of the Dominican amber (Hymenoptera: Formicidae). 3. The subfamily Dolichoderinae. — Psyche, 92: 17–37; Cambridge/Mass. — [1985 c]
- (1985): Invasion and extinction in the West Indian ant fauna: evidence from the Dominican amber. — Science, 229: 265–267; Washington DC. — [1985 d]
- (1986): Ants of the Dominican amber (Hymenoptera: Formicidae). 4. A giant ponerine in the genus *Paraponera*. — Israel J. Ent. 19: 197–200; Tel Aviv.

- (1988): The biogeography of the West Indian ants (Hymenoptera: Formicidae). – *In*: LIEBHERR, J. K. (ed.): Zoogeography of Caribbean insects, pp. 214–230; Ithaca (Cornell University Press).

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